In the Specification:

Please amend the specification as follows:

On page 1, line 10, delete the following:

~~Brief Description of the Invention.~~

~~The object of the present invention is to show how the reaction resistance R_P can be further reduced as well as how further advantages in form of an increased conductivity and a limited catalytic activity can be obtained.~~

~~An electrochemical cell of the above type is according to the invention characterized in that the added amount of Mn represents 0.5 to 5 metal atom%, preferably 1 to 4 metal atom%, especially 2 to 3 metal atom%.~~

~~An electrochemical cell can be produced by applying electrodes onto a carrier electrolyte or electrolyte on a carrier electrode. The cell can be produced by intermediate sinterings or be sintered when more or all the components are assembled.~~

~~An electrochemical cell can be used within several fields, said cell comprising an electrolyte, which is also called a membrane, in contact with two electrodes of a predetermined composition where at least one electrode is subjected to a gas mixture which has a reducing effect compared to air. Below four examples are presented of how the electrochemical, electric and catalytic properties of such a nickel based electrode are of vital importance for the efficiency of the cell.~~

~~i) a solid oxide fuel cell (SOFC) is a catalytic cell mainly comprising an electrolyte with an anode and a cathode on opposed sides. A nickel electrolyte composite is widely used as the anode. The electrolyte is most frequently a Y-doped $Zr0_2$ (YSZ). The anode is most frequently produced by way of sintering in air, the reason why NiO is used. During operation the NiO is reduced to Ni in the reducing~~

~~anode gas. The fuel cell can be supplied with a gas, such as hydrogen or methane, and produce current or be driven by means of the current and dissociate for instance water or carbon dioxide.~~

~~ii) An electrochemical reactor can be used for a chemical synthesis by way of a complete or partial oxidation of a compound, such as for instance methane, ethane or methanol. The reactor can be based on electrochemical cells with two electrodes, where at least one electrode, viz. the active electrode, catalyzes the oxidation. This electrode is typically nickel based.~~

~~iii) An oxygen separation membrane can be used for the production of for instance synthesis gas by way of a partial oxidation of for instance methane. This membrane can be a dense electrolyte as stated above or an electrolyte which has been provided with an electronic conductivity, viz. be internally short circuited, and on which a nickel based electrolyte catalyzes the oxidation. A reactant, such as for instance oxygen, water or carbon dioxide can be mixed into the reducing gas or oxygen can be supplied in ionic form through the membrane. This process can be electrically driven by transmitting a current through the cell, viz. the compact electrolyte, or the cell can be internally short circuited, viz. the electrolyte with the electronic conductivity.~~

~~iv) As a sensor for measuring the composition of the gas.~~

~~In the four examples i)to iv) the nickel based electrode has been subjected to a reducing atmosphere, in which a complete or partial oxidation or reduction of a reactant takes place. The fundamental function of the electrochemical cell is thus to oxidize for instance methane, hydrogen or carbon monoxide while delivering an electric current, or to drive the process in the opposite direction by applying a current and dissociating for instance water into hydrogen and oxygen.~~

~~The efficiency of the electrode is typically defined by the following three values: A) the power loss associated with the electrode process, B) the electric conductivity of the electrode, and C) the catalytic activity of the electrode.~~

~~Below these properties are discussed in connection with nickel based electrodes or catalytically active components used in a fuel cell, an electrochemical reactor and on an oxygen separation membrane or the like.~~

On page 3, line 17, delete the following:

~~**Definition of problems**~~

~~A) An improvement of the efficiency of the electrochemical cell and a reduction of the costs give rise to a demand for reducing the power loss ($W_{TAB}=R_P i^2$) associated with the electrode process and below expressed by the reaction resistance R_P also called the polarization resistance. It turned out that an Ni/YSZ composite electrode with respect to function, but not necessarily to production can be divided into two zones with different primary functions. The electrode is electrochemically active in a range of 10 to 20 µm from the compactly sintered electrolyte, which means that here the reactants are reacted by way of oxidation reduction while releasing or receiving electrons. This layer is associated with the lowest achievable reaction resistance RP for the electrode in question.~~

~~B) The primary function of the superposed electrode structure is contacting and as electron conductor because the reactants in the active layer are only reacted in so far as electrons can be transmitted to or from the electrode. This conductivity is substantial because a predetermined distance of the magnitude of mm or more can exist in the technical structure of the electrochemical cell between the contact points of the electrode and the structure establishing the electric contact to the cell.~~

~~C) As far as an SOFC driven on natural gas or methane is concerned, the endothermal steam reforming reaction should for optimizing reasons be carried out on or adjacent the active cell where heat is generated. The strong catalytic properties of~~

~~nickel have the effect that the steam reforming reaction on a nickel based electrochemical cell typically occurs over the first few mm of the electrode adjacent the gas inlet, whereby this part of the system is strongly cooled. As a result, thermal gradients arise in the system which in turn involves a risk of breakings. Accordingly there is a demand for a possibility of suppressing the activity of a specific amount of nickel in the electrode with respect to the catalytic reaction of hydrocarbons. This demand applies to the entire electrode structure and primarily to the superposed electrode part which handles the conductivity of the electrode as this part presents the largest nickel surface.~~

On page 4, at line 24, delete the following:

~~Backgound Art~~

On page 5, beginning at line 7, amend the paragraph as follows:

~~In stead~~ Instead of the typical ZrO_2 based electrolyte, it is possible to use a mixed conductor based on for instance PrO_x~~,~~ and CeO_2~~)~~, whereby the R_P is reduced. Again, the raw materials are relatively expensive.

On page 6, line 1, amend the heading as follows:

Brief Summary ~~Description of the Invention~~

On page 6, line 1, insert the following:

Definition of problems

A) An improvement of the efficiency of the electrochemical cell and a reduction of the costs give rise to a demand for reducing the power loss ($W_{TAB}=R_P i^2$) associated with the electrode process and below expressed by the reaction resistance R_P also called the polarization resistance. It turned out that an Ni/YSZ composite electrode with

respect to function, but not necessarily to production, can be divided into two zones with different primary functions. The electrode is electrochemically active in a range of 10 to 20 μm from the compactly sintered electrolyte, which means that here the reactants are reacted by way of oxidation reduction while releasing or receiving electrons. This layer is associated with the lowest achievable reaction resistance RP for the electrode in question.

B) The primary function of the superposed electrode structure is contacting and as electron conductor because the reactants in the active layer are only reacted in so far as electrons can be transmitted to or from the electrode. This conductivity is substantial because a predetermined distance of the magnitude of mm or more can exist in the technical structure of the electrochemical cell between the contact points of the electrode and the structure establishing the electric contact to the cell.

C) As far as an SOFC driven on natural gas or methane is concerned, the endothermal steam reforming reaction should for optimizing reasons be carried out on or adjacent to the active cell where heat is generated. The strong catalytic properties of nickel have the effect that the steam reforming reaction on a nickel based electrochemical cell typically occurs over the first few mm of the electrode adjacent the gas inlet, whereby this part of the system is strongly cooled. As a result, thermal gradients arise in the system which in turn involves a risk of breaking. Accordingly there is a demand for a possibility of suppressing the activity of a specific amount of nickel in the electrode with respect to the catalytic reaction of hydrocarbons. This demand applies to the entire electrode structure and primarily to the superposed electrode part which handles the conductivity of the electrode as this part presents the largest nickel surface.

On page 6, line 7, delete the following:

~~The problems b) and C) are solved by means of the features indicated in claim 2.~~

On page 6, line 7, insert:

The object of the present invention is to show how the reaction resistance R_P can be further reduced as well as how further advantages in form of an increased conductivity and a limited catalytic activity can be obtained.

An electrochemical cell of the above type is according to the invention characterized in that the added amount of Mn represents 0.5 to 5 metal atom%, preferably 1 to 4 metal atom%, especially 2 to 3 metal atom%.

An electrochemical cell can be produced by applying electrodes onto a carrier electrolyte or electrolyte on a carrier electrode. The cell can be produced by intermediate sinterings or be sintered when more or all the components are assembled.

An electrochemical cell can be used within several fields, said cell comprising an electrolyte, which is also called a membrane, in contact with two electrodes of a predetermined composition where at least one electrode is subjected to a gas mixture which has a reducing effect compared to air. Below four examples are presented of how the electrochemical, electric and catalytic properties of such a nickel based electrode are of vital importance for the efficiency of the cell.

i) a solid oxide fuel cell (SOFC) is a catalytic cell mainly comprising an electrolyte with an anode and a cathode on opposed sides. A nickel electrolyte composite is widely used as the anode. The electrolyte is most frequently a Y-doped $Zr0_2$ (YSZ). The anode is most frequently produced by way of sintering in air, the reason why NiO is used. During operation the NiO is reduced to Ni in the reducing anode gas. The fuel cell can be supplied with a gas, such as hydrogen or methane, and produce current or be driven by means of the current and dissociate for instance water or carbon dioxide.

ii) An electrochemical reactor can be used for a chemical synthesis by way of a complete or partial oxidation of a compound, such as for instance methane, ethane or methanol. The reactor can be based on electrochemical cells with two electrodes, where at least one electrode, viz. the active electrode, catalyzes the oxidation. This electrode is typically nickel based.

iii) An oxygen separation membrane can be used for the production of for instance synthesis gas by way of a partial oxidation of for instance methane. This membrane can be a dense electrolyte as stated above or an electrolyte which has been provided with an electronic conductivity, viz. be internally short circuited, and on which a nickel based electrolyte catalyzes the oxidation. A reactant, such as for instance oxygen, water or carbon dioxide can be mixed into the reducing gas or oxygen can be supplied in ionic form through the membrane. This process can be electrically driven by transmitting a current through the cell, viz. the compact electrolyte, or the cell can be internally short circuited, viz. the electrolyte with the electronic conductivity.

iv) As a sensor for measuring the composition of the gas.

In the four examples i)to iv) the nickel based electrode has been subjected to a reducing atmosphere, in which a complete or partial oxidation or reduction of a reactant takes place. The fundamental function of the electrochemical cell is thus to oxidize for instance methane, hydrogen or carbon monoxide while delivering an electric current, or to drive the process in the opposite direction by applying a current and dissociating for instance water into hydrogen and oxygen.

The efficiency of the electrode is typically defined by the following three values: A) the power loss associated with the electrode process, B) the electric conductivity of the electrode, and C) the catalytic activity of the electrode.

On page 9, beginning at line 22, amend the paragraph as follows:

In order to illustrate the effect of adding MnO_X to Ni based electrodes, a reference electrode without MnO_X and test electrodes with MnO_X have been produced, cf. Table IA. The electrodes comprising a first, a second and a third electrode layer 18, 19, 20 are applied onto both sides of sintered 8YSZ ($Zr0_2$ doped with 8 mol % Y_20_3) electrolytes 1, cf. Fig. 1. The electrolytes 1 are of a thickness of 160 to 180 µm. A contact face 22 <u>(shown in Fig. 2)</u> is provided between the electrolyte 1 and the first electrode layer 18. The produced cells are fragmented into almost square elements of an area of approximately 0.1 to 0.2 cm_2 and mounted between four platinum wires 6 in such a manner that two elements are provided on the central portion of each electrode surface, cf. Fig. 2. The cells are placed in an oven in a controlled atmosphere of hydrogen moistened with 3% water at 25°C. The impedance of the cells is measured by impedance spectroscopy at open voltage (η=0) at 850°C and 1000°C. Such a measuring is illustrated in Fig. 3.

On page 12, beginning at line 13, amend the paragraph as follows:

In order to document the positive effect of MnO_X~~-~~on the inplane conductivity of a composite nickel based electrode layer, two Ni/8YSZ ($Zr0_2$ doped with 8 mol% Y_20_3) electrode layers are produced with and without MnO_x. The comparison appears from Table 1B. The electrode layers are sprayed onto 10 to 20 µm thin Ni/8YSZ anodes on 8YSZ electrolytes, cf. Fig. 5 showing the electrolyte 1, onto which an active electrode layer 23 and an electrode layer 24 have been applied.

Please amend the Abstract as follows:

An electrochemical cell, such as an SOFC cell, comprising a nickel based electrode structure, such as in form of an ~~NI~~ <u>Ni/</u>YSZ anode, to ~~whichMn~~ <u>which Mn</u> has been added. According to the invention, the added amount of Mn of the part of the anode extending less than 20 µm from the electrolyte represents 0.5 to 5 metal atom%. As a result, the efficiency of the electrode is increased, said efficiency typically being

defined by the power loss associated with the electrode process, the electric conductivity of the electrode and the catalytic activity of said electrode.